

Packaging Material

*Insp* The invention relates to a packaging material with hologram-like image and the use of the packaging material.

5 2. Background Art

It is known to provide packaging materials or auxiliary packaging items - such as labels or sealing strips - with holograms as a non-falsifiable means of identifying the product source or as original closure. The production of holograms calls for specially selected materials that are treated in a series of manufacturing steps to yield the desired end product. Forms of  
10 packag-ing bearing holograms give consumers the impression that the contents of the packaging are of high quality. There are also many products that do not require an expensive hologram for protection against falsification, but which one would like to be able to make use of the quality-implication of the hologram on more cost favourable forms of packaging.

Broad Description of the Invention

15 The object of the present invention is to propose a packaging material which exhibits a hologram-like image on the whole or parts of the packaging, at least on the side facing outwards.

That objective is achieved by way of the invention in that the packaging material is a multi-  
20 layered with a layer structure containing:

- a) a completely or partially embossed metal foil or metallised plastic film and,
  - b) on top, at least in specific areas, a transparent single or multi-layered plastic layer -
- where the plastic layer b) forms the outer-lying layer of the packaging and the embossed image on the metal foil or metallised plastic film a) is visible through the transparent areas.

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On a finished form of packaging made from the above packaging material the plastic layer b) faces outwards. Further functional layers e.g. of plastic and/or paper may be provided on the free side of the metal foil.

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Detailed Description of the Invention

The metal foil may e.g. be an iron, steel, copper, gold and in particular an aluminium foil. The foils may have a thickness of e.g. 7 to 100  $\mu\text{m}$ , usefully 7 to 40  $\mu\text{m}$  and advantageously 8 to 40  $\mu\text{m}$ . The aluminium foils may be of pure aluminium of purity e.g. 98.3% and higher, or they may be of an aluminium alloy, for example of the AlFeSi or AlFeSiMn type. If  
35 metallised plastic films are employed, the plastic of the films may be e.g. of polyamides, polyesters, polyolefins, polyvinylchloride, polycarbonates etc. The thickness of the plastic films may be e.g. from 7  $\mu\text{m}$  to 100  $\mu\text{m}$ , preferably from 12  $\mu\text{m}$  to 100  $\mu\text{m}$ . On at least one of the surfaces of the plastic film is a metal layer e.g. of iron, nickel, chromium, copper, silver,

gold, aluminium etc. of thickness for example of 5 to 500 nm (Nanometre) produced by a metallising process such as a physical or chemical thin layer deposition process in vacuum by sputtering etc.

- 5 The metal foil or the metallised plastic film feature an embossed pattern which may cover the whole, some or parts of the surface area. The embossed pattern may be created on the foil by means of embossing rolls. The embossing rolls exhibit the desired embossing pattern and the foil is passed e.g. with a paper coating between the embossing roll and a counter roll. The pattern or image on the embossing roll is thereby transferred to the foil. The
- 10 embossing may be a series of lines, regular or irregular repeated patterns, damask, worm-like, beaten-type pattern etc. all other kinds of pattern are feasible such as script, figures and abstract patterns, pictures, logos or combinations thereof. It is also possible to colour or print onto the embossed areas and, as desired, also the intervening non-embossed areas. This way it is possible to alter the optical effect of embossing e.g. reinforcing, weakening or
- 15 alternating according to the angle of the incident light.

- The single layer of plastic film may be a plastic film produced by calendering e.g. hot-calendering. The thickness of the calendered single layer plastic film may be 20 to 200  $\mu\text{m}$ . Plastics that may be employed are thermoplastics such as polyolefin. The plastic layer may be
- 20 plastic film of at least two layers which has been manufactured by coextrusion. The thickness of each single layer may be 20 to 200  $\mu\text{m}$ . Plastics that may be employed are thermoplastics such as ionomer resins (Surlyn) and polyolefins. The plastic layer may be a thermoplastic deposited as a film on the metal foil by lacquer coating. Useful is a solvent-containing or solvent-free lacquer coating. The lacquer coating may contain or be of a
- 25 polyolefin. A film of thermoplastic may also be deposited on the metal foil by means of a melt extrudate of a thermoplastic. The melt extrudate may be of or contain a polyolefin. The amounts of lacquer or melt extrudate may be from 3 to 80  $\text{g/m}^2$ , usefully from 30 to 50  $\text{g/m}^2$ . The film of thermoplastic may be a monofilm or a two, three or multi-layered film or laminate. The film contains or is comprised of polyolefines. The total thickness of the
- 30 thermoplastic film is e.g. 20 to 200  $\mu\text{m}$ , usefully 40 to 150  $\mu\text{m}$ , preferably 90 to 120  $\mu\text{m}$ .

- The plastic layer is usefully transparent or at least transparent in some areas. The plastic layer may be coloured or clear. The plastic layer may bear printing. In the case of lacquer coating, the film may bear a printed or counterprint image. The printing and any non-
- 35 transparent areas of the plastic layer are arranged such that at least some areas of the embossed pattern in the metal foil remain visible through the transparent part of the plastic layer.

Preferred thermoplastics are e.g. polyolefines. Examples of polyolefines are polyethylenes e.g. high density polyethylene (HDPE, density greater than  $0.944 \text{ g/m}^3$ ), medium density polyethylenes (MDPE, density  $0.926\text{--}0.940 \text{ g/m}^3$ ), linear medium density polyethylene (LMDPE, density  $0.926\text{--}0.940 \text{ g/m}^3$ ), linear low density polyethylene (LLDPE, density  $0.916\text{--}0.925 \text{ g/m}^3$ ) or mixtures thereof. Other polyolefines are polypropylenes such as amorphous, crystalline or highly crystalline polypropylene, atactic or isotactic polypropylene and mixtures of the above mentioned polypropylenes, cast polypropylene, poly-1-butene, poly-3-methylbutene, poly-4-methylpentene and copolymers thereof such as polyethylene with vinylacetate, vinylalcohol or acrylic acid. Also worthy of mention are copolymers known as ionomer resins of ethylene with about 11% acrylic acid, methacrylic acid, acrylic esters, tetrafluorethylene or propylene. The corresponding statistical copolymers, block polymers or olefin-polymer-elastomer mixtures also belong to the above mentioned polymers. The films are non-stretched and, preferably, axially or biaxially stretched films. The films may be monolayer materials or a two, three or multi-layered laminate.

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Useful packaging materials have a layer structure containing:

- a) a wholly or partially embossed metal foil, in particular an aluminium foil,
- b) a multi-layered plastic layer of
  - b<sub>1</sub>) a lacquer coating or a melt extrudate and
  - b<sub>2</sub>) a film containing a polyolefin.

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Packaging materials preferably exhibit a layer structure containing:

- a) a wholly or partially embossed metal foil, in particular an aluminium foil,
- b) a multi-layered plastic layer of
  - b<sub>1</sub>) a melt extrudate of polyethylene and
  - b<sub>2</sub>) a film containing mainly or comprised of polyethylene.

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The free side of the metal foil or the metallised plastic film may bear further functional layers. The choice of the functional layers is determined by the use to which the packaging material will be put. The free side of the metal foil or metallised plastic film may e.g. bear one or more further plastic layers and/or a paper layer or a paper layer and one or more plastic layers and/or further metal foils or metallised plastic films. The plastic layers may be deposited by lacquer coating, calendering or by coextrusion. As a rule papers are applied by lacquer coating or adhesive bonding.

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The packaging material according to the invention may e.g. feature plastic films on the free side of the metal foil or metallised plastic film deposited there by lacquer coating or coextrusion. Advantageously, the plastic layers contain thermoplastics such as the above

mentioned polyolefines, the polyethylenes and polypropylenes being especially suitable. A lacquer or laminate coating of e.g. 3 to 80 g/m<sup>2</sup> may be employed. Plastic films may have a thickness of 20 to 150 µm, usefully 20 to 100 µm and preferably 50 to 80 µm.

- 5 When in the form of packaging made from the said packaging material, the functional layers on the free side of the metal foil or metallised plastic film face the inside of the packaging i.e. towards the contents of the packaging. For that reason it can be advantageous to provide a barrier layer in the functional layers in order to prevent ingress of fluids, vapours, aromas etc. into the functional layer. The outermost layer, facing out from the packaging, and/or the  
10 innermost layer, facing the contents of the packaging, may be a sealable layer. If the layers described are not inherently sealable, then an additional sealing lacquer or sealable film may be employed.

- The packaging material may - according to the make up of the layers - be employed for  
15 various forms of packaging. For example, the packaging materials mentioned are suitable for manufacturing wrapping films, boxes, bags, pouches, self-standing pouches, sachets, goblets, lidding materials for any kind of base parts such as dishes or menu dishes in the food industry or as push-through and blister packs in the pharmaceutical industry and, preferably, as tubes.

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The present invention concerns therefore advantageously also the use of the packaging material for tubes. A particularly suitable packaging material for tubes has the following make up:

- 25 a<sub>1</sub>) a functional layer

a) a wholly or partially embossed metal foil, in particular an aluminium foil or a wholly or partially embossed metallised plastic film

b) a multi-layered plastic film of

b<sub>1</sub>) a lacquer coating or a melt extrudate and

- 30 b<sub>2</sub>) a film containing a polyolefin.

The film b<sub>2</sub>) may be provided with a printed pattern on one or both sides over part of its surface area.

- 35 The functional layer a<sub>1</sub>) may be a plastic film applied to the metal foil or metallised plastic film by calendering, lacquer coating or by coextrusion.

A packaging material as an example suitable for tube manufacture has the following make up:

- 5 a<sub>1</sub>) a functional layer of a film containing polyolefines, in particular polyethylenes or polypropylenes and of thickness 20 to 150  $\mu\text{m}$  and
  - a lacquer coating or a melt extrudate of a polyethylene, in an amount ranging from 3 to 80  $\text{g}/\text{m}^2$ ,
- a) a wholly or partially embossed metal foil, in particular an aluminium foil or a wholly or partially embossed metallised plastic film of thickness 7 to 100  $\mu\text{m}$
- 10 b) a multi-layered plastic film of
  - b<sub>1</sub>) a lacquer coating or a melt extrudate of a polyethylene, in an amount of 3 to 80  $\text{g}/\text{m}^2$ , and
  - b<sub>2</sub>) a film containing polyolefines. In particular polyethylene or polypropylene and having
- 15 a thickness of 20 to 200  $\mu\text{m}$ .

This concerns a packaging material which, with respect to the metal foil or metallised plastic film, exhibits by way of example a symmetrical arrangement of layers. The thickness of the individual layers may likewise be chosen such that this is also symmetrical. According to the  
 20 invention packaging materials may also have an asymmetric structure. In a tube manufactured from the packaging material the polyolefin film represents the functional layer a<sub>1</sub>) the inner side, and the polyolefin film b<sub>2</sub>) the outer side of the tube and in particular thereby the tube itself as such. The polyolefines are as a rule sealable. For that reason a tube can be manufactured from the packaging material by providing sealing or adhesive seams.  
 25 The packaging material in question is especially suitable for manufacturing the pipe shape of a tube. The attachment of the tube head and the closure of the tube end may likewise be performed by sealing or e.g. by adhesive bonding or welding.

A typical packaging material for tubes exhibits the following layered structure:

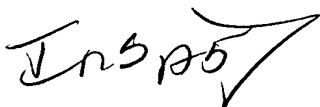
- 30 a<sub>1</sub>) a functional layer which faces the inside of the tube, made of a polyethylene film of thickness 40 to 80  $\mu\text{m}$ ,
  - a lacquer coating or a melt extrudate of polyethylene of 30 to 50  $\text{g}/\text{m}^2$ ,
- a) a wholly or partially embossed aluminium foil or a wholly or partially embossed  
 35 metallised plastic film of thickness 8 to 40  $\mu\text{m}$ ,
- b) a multi-layered transparent plastic layer of
  - b<sub>1</sub>) a lacquer coating or a melt extrudate of polyethylene of 30 to 50  $\text{g}/\text{m}^2$ , and

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b2) a polyethylene film of thickness from 20 to 200  $\mu\text{m}$ , which forms the outside of the tube.

Figure 1 shows a section through an example of a packaging material 9 according to the invention. The embossed metal foil 10 is coated on the side that later forms the outside of the packaging with a layer 11 of melt extrudate of a low density polyethylene. On top is a film 13 like a three layer film of polyethylene. Possible printing is shown in the form of print 15 on the surface and a counterprint 16. The coating 11 and the film 13 are transparent and the embossing 17 are visible through the plastic layer of melt extrudate 11. On the still free side of the metal foil 10 is a further layer 12 of a melt extrudate and on top of that a further film 14, e.g. a polyethylene film. If a tube or at least the pipe part of a tube is made from the packaging material 9, then the film 14 faces the inside of the tube and hence the contents. The layer 12 and the film 14 may be transparent or opaque. It can be advantageous to provide a barrier layer in or on the film 14, in order to prevent the contents or parts thereof from diffusing into the plastic layer, causing the contents to perish prematurely or delamination of the packaging material. For an observer of a tube made from the packaging material according to the invention the embossed image is visible through the plastic layer, this in addition to any printed image or pattern made up by the printing 15 and counterprint 16. The metallic brightness and the reflection of the metal foil 10, and thereby in particular the reflection influenced by the embossing, lead to optical effects which can be best compared with the visual impressions achieved by holograms. By making use of printing 15 and counterprinting 16 and/or only partially transparent and/or coloured films 13 and/or coloured embossed images 17 in the metal foil 10 a variety of graphic design possibilities can be achieved for the packaging or tube exterior. A packaging material such as that described here may be manufactured by embossing the metal foil 10 using embossing rolls, coating one side with a melt extrudate 11 of the plastic film 11 on one side of the metal foil 10 and, in a further processing step, applying by means of a melt extrudate 12 of the other plastic film 14 to the still free side of the metal foil 10. Of course the coating sequence may be altered or the steps may be carried out simultaneously.

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